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Harold E. Meier
Baker Botts L.L.P.
Suite 600
2001 Ross Avenue
Dallas, TX 75201

EXAMINER	
FERRIS III, FRED O	

ART UNIT	PAPER NUMBER
2128	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/839,463	WELTERLEN, TRACY J.	
	Examiner	Art Unit	
	Fred Ferris	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 May 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *04/20/01*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-23 have been presented for examination based on applicant's disclosure filed on 20 April 2001 and pre-amendment filed 10 May 2001. Claims 1-23 have been rejected by the examiner.

Drawings

2. Applicant's drawings filed on 20 April 2001 have been approved by the examiner.

Claim interpretation

3. Applicant's are claiming limitations relating to a method and system for simulating a flow field (around an aircraft) by generating a grid of cells with associated variables that describe the flow field and then calculating average values over a predetermined number of time periods. Applicant's specification (pages 6, 8-10) discloses the use of popular commercially available software packages such as AutoCAD, Pro/ENGINEER, FLUENT, and Field View to perform the grid generation, CFD, survey/interpolation, and aircraft solid modeling functions. The examiner notes that many of the inventions claimed features relating to the grid generation, calculating of cell variables, sampling/averaging values, and system modules for performing these processes, are inherently provided in these commercial CFD analysis and solid modeling software products. However, the language of the claims, and the specification, do not clearly define where the commercially available software used by applicant's invention (i.e. Pro/ENGINEER, Field View, etc.) leaves off, and applicant's invention begins. (See

112(2) rejection below) The examiner has therefore interpreted certain claimed limitations to be standard features inherently provided by these commercially available software packages. (See 35 USC 102/103 rejections below.)

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. *The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.*

Specifically, independent claims 1, 11, 17 and 23 each contain limitations relating to "calculating a value for each variable of each cell" that has not been sufficiently disclosed in the specification. While the specification makes reference to the "software modules 108 performing calculations for simulating field flow" (page 8, line 16), there is no sufficient teaching that would allow a skilled artisan to realize the calculation of a value for each variable of each cell from the description given in the specification. Page 12, line 21 and page 13, line 16 also mention field flow calculation but again give no sufficient description of how the calculations are performed. Is the

calculation of a value for each variable of each cell simply computed by the Pro/ENGINEER or FLUENT software mentioned on page 9, line 2 of the specification? The examiner notes that the specification, for example, gives an adequate (clear and concise) description of the averaging of the calculated values on page 10, line 1-7. However, there is no similar description given for the process of "calculating a value for each variable of each cell" sufficient to allow one skilled in the art to make and use the claimed subject matter without undue experimentation. Figures 1-3 do not cure this deficiency. The examiner therefore submits that the specification does not provide a clear and concise description of the subject matted claimed in independent claims 1, 11, 17 and 23.

Dependent claims 2-10, 12-16, and 18-22 inherit the deficiency of the claims from which they depend.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. ***Claims 1-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.***

Per independent claims 1, 11, and 23: Claim 1 includes limitations relating to determining the unsteady flow field from the averaged values, while claims 11 and 23

include limitations relating to applying a simulation process to the adjusted values.

MPEP 2171 requires the following:

2171 Two Separate Requirements for Claims Under 35 U.S.C. 112, Second Paragraph

The second paragraph of 35 U.S.C. 112 is directed to requirements for the claims:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

There are two separate requirements set forth in this paragraph:
(A) the claims must set forth the subject matter that applicants regard as their invention; and
(B) the claims must particularly point out and ***distinctly define the metes and bounds of the subject matter that will be protected by the patent grant****.*

The first requirement is a subjective one because it is dependent on what the applicants for a patent regard as their invention. The second requirement is an objective one because it is not dependent on the views of applicant or any particular individual, but is evaluated in the context of whether the claim is definite — i.e., whether the scope of the claim is clear to a hypothetical person possessing the ordinary level of skill in the pertinent art.

In the case of claim 1, it is unclear specifically how the "unsteady" field flow is determined. While specification references the use of FLUENT software (page 9, line 2), and transient periods where the flow field is "steady" (page 12, line 3, page 13, line 7), no indication is given either by the specification, or the claims, what limitations, or what process is used to ultimately determine an "unsteady" flow field.

In the case of claims 11 and 23, it is unclear specifically what simulation process is applied to the adjusted values. Is this process simply the combined execution of the Pro/ENGINEER and FLUENT software indicated on page 9, line 2 of the specification?

Per independent claim 17: It is unclear how the claimed flow field and averaging modules are realized. Are these modules simply the implementation of the FLUENT and FIELD VIEW software indicated on page 10, line 22 of the specification?

The examiner therefore submits that independent claims 1, 11, 17 and 23 do not ***distinctly define the metes and bounds of the claimed subject matter*** *because it is unclear specifically where the limitations of applicants claimed invention begin and end. In particular, it is unclear exactly where the commercially available software used by applicant's invention (i.e. Pro/ENGINEER, Field View, FLUENT, etc.) leaves off, and applicant's invention begins. In general, the language of the independent claims 1 and 11 fails to point out specifically what is* ***included*** *or* ***excluded*** *by the language of the claims and a person of ordinary skill in the art would be at odds to determine the exact scope of the claim.*

Dependent claims 2-10, 12-16, and 18-22 inherit the deficiency of the claims from which they depend.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 5, 17, and 22, are rejected under 35 U.S.C. 102(b) as being anticipated by "UFAT – A Particle Tracer for Time-Dependent Flow Fields", D. Lane, IEEE 1070-2385/94, 1994 IEEE.

Per independent claim 1: Lane discloses the Unsteady Flow Analysis Toolkit (UFAT) for analysis of time-dependent (unsteady) flow fields generated using CFD simulation. Lane discloses generating a grid of cells with variables describing an unsteady flow field (page 259, Section 5.0) and calculating cell variable from previous values (page 260, col. 2, para: 1) on a time increment (period) basis for a predetermined number of periods and applying the flow field function (page 259, Sections 2.0, 5.2). Lane further discloses interpolating the calculated values (page 260, col. 2, para:1) to achieve an average value of the sampled time intervals (page 261, col. 1, para:1, 5.3) and determining the unsteady field flow (page 261, Section 7.0)

Per dependent claim 5: Lane discloses calculating values on a time increment (period) bases as noted above (page 260, col. 2, para: 1). Recording the values at predetermined steps would be necessarily inherent to the interpolation process since the process requires one to interpolate between known (i.e. stored/recorded) data points.

Per independent 17: Lane discloses the UFAT system implemented on a standard graphics workstation accessible via a network (page 261, Section 6.0) As previously noted above, Lane further discloses the Unsteady Flow Analysis Toolkit (UFAT) for analysis of time-dependent (unsteady) flow fields generated using CFD simulation. Lane discloses generating a grid of cells with variables describing an

unsteady flow field (page 259, Section 5.0) and calculating cell variable from previous values (page 260, col. 2, para: 1) on a time increment (period) basis for a predetermined number of periods and applying the flow field function (page 259, Sections 2.0, 5.2). Lane further discloses interpolating the calculated values (page 260, col. 2, para:1) to achieve an average value of the sampled time intervals (page 261, col. 1, para:1, 5.3) and determining the unsteady field flow (page 261, Section 7.0)

Per dependent claim 22: The functions of the interpolation module and simulation module recited in dependent claim 22, would be necessarily inherent processes to the UFAT system disclosed by Lane (page 260, col. 2, para: 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 2-4, 6-16, 18-21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over "UFAT – A Particle Tracer for Time-Dependent Flow Fields", D. Lane, IEEE 1070-2385/94, 1994 IEEE in view of "An Implicit Upward Algorithm for Computing Turbulent Flows of Unstructured Grids", W.K. Anderson et al, Computer Fluids, Vol. 23, No. 1, pp. 1-21, 1994

Independent claims 11 and 23 are drawn to:

system and method for simulating flow field by:
- generating a grid of cells with variables describing an unsteady flow field;
- calculating each cell variable from previous value at each period for predetermined number of periods by applying Navier-Stokes function to previous value;
  - averaging calculated values for each cell variable to yield averaged value for each variable;
  - adjusting averaged values to a survey grid
- applying a simulation process to the adjusted values.

Regarding independent claims 11 and 23: As previously cited above, Lane discloses the elements of the claimed limitations relating to generating a grid of cells with variables describing an unsteady flow field (page 259, Section 5.0) and calculating cell variable from previous values (page 260, col. 2, para: 1) on a time increment (period) basis for a predetermined number of periods and applying the flow field function (page 259, Sections 2.0, 5.2). Lane further discloses interpolating the calculated values (page 260, col. 2, para:1) to achieve an average value of the sampled time intervals (page 261, col. 1, para:1, 5.3) and determining the unsteady field flow (page 261, Section 7.0) Lane discloses these elements via the Unsteady Flow Analysis Toolkit (UFAT) for analysis of time-dependent (unsteady) flow fields generated using CFD

simulation. The UFAT system is implemented on a standard graphics workstation accessible via a network (page 261, Section 6.0).

Lane does not explicitly disclose applying a Navier-Stokes function or adjusting the averaged values to a survey grid.

Anderson discloses applying a time dependent (and averaged) Navier-Stokes function (page 4, Section 3.0, para:1, page 10, Section 4.2, para: 5, Fig. 8) to a simulated grid of cells. Regarding adjusting the averaged values to a survey grid the examiner notes that the Field View software cited in applicant's specification (page 10, line 22) as a preferred method of implementing the interpolation module, appears to provide the capability for capturing and averaging grid data to form a survey grid. (See: "FieldView 7", Press Release, October 2000, Intelligent Light, Inc. pp. 2-3) Hence, a skilled artisan would have knowingly incorporated the Field View software as an obvious design choice for implementing the claimed survey grid.

It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings Lane relating to generating a grid of cells with variables describing an unsteady flow field, with the teachings of Anderson relating to applying a time dependent Navier-Stokes function, to realize the claimed invention. An obvious motivation exists since, in this case, the Lane reference teaches to the Anderson reference, and the Anderson reference teaches to the Lane reference. Specifically, both Lane and Anderson teach flow field simulation via a generated grid of cells and are both used in the same technical arena as noted above. Lane teaches to Anderson because Lane discloses generating a grid of cells with variables describing a

time dependent unsteady flow field. (See: Lane page 260, col. 2, para: 1). Anderson teaches to Lane because Anderson specifically discloses the use of a time dependent (and averaged) Navier-Stokes function in flow field simulation. (See: Anderson Section 3.0) Further, the level of skill required by an artisan to realize the claimed limitations of the present invention is clearly established by both references. (See: Lane /Anderson, Abstract/Background) Accordingly, a skilled artisan having access to the teachings of Lane and Anderson, would have knowingly modified the teachings of Lane with the teachings of Anderson (or visa versa) to realize the claimed elements of the present invention.

Per dependent claims 2 and 12: Anderson discloses modeling the turbulence associated with aircraft components (page 12, section 4.4, Figs. 8, 13, 14). Hence, a skilled artisan would have knowingly modified the turbulence to model taught by Anderson to model the bay of an aircraft. (i.e. another aircraft component)

Per dependent claims 3 and 13: Lane further discloses determining the transient (time iteration) period for computed values. (Section 5.2)

Per dependent claims 4 and 19: Anderson discloses applying a Navier-Stokes function as noted above. (page 4, Section 3.0, para:1)

Per dependent claims 6 and 20: Both Lane and Anderson disclose cell time periods (iterations) that are substantially equivalent (See Lane: Section 5.2, Anderson: Section 4.2)

Per dependent claims 7 and 21: Anderson teaches a time-dependent grid structure with where the period is less for a smaller grid. (See: Figs. 8, 13, 14) This feature would also be inherent in a CFD Pro/ENGINEER created grid.

Per dependent claim 8: As noted above, Field View provides the capability for capturing and averaging grid data to form a survey grid while Pro/ENGINEER provides the simulation process.

Per dependent claim 14: Lane discloses calculating values on a time increment (period) bases as noted above (page 260, col. 2, para: 1). Recording the values at predetermined steps would be necessarily inherent to the interpolation process as noted above.

Per dependent claim 18: Anderson discloses a backward (previous) time scheme applied to the flow field grid. (Section 4.2, para:1)

Per dependent claims 9, 10, 15, and 16: This group of claims merely includes limitations relating to the grid cell variables including velocity, pressure, temperature, Momentum, etc.. These features are cdisclosed by Lane on page 259, Section 5.0.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Careful consideration should be given prior to applicant's response to this Office Action.

"Visualization of Time-Dependent Flow Fields", D. Lane, IEEE 1070-2385/93, 1993 IEEE teaches aircraft flow field simulation.

"Unsteady Flow Volumes", B. G. Becker et al, Proceedings VISUALIZATION '95, pp. 329-335 teaches flow field simulation.

"Visualization of High Speed Aerodynamic Configuration Design", M. Hannemann, Proceedings VISUALIZATION '95, pp. 355-358 teaches aircraft flow field simulation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred Ferris whose telephone number is 571-272-3778 and whose normal working hours are 8:30am to 5:00pm Monday to Friday. Any inquiry of a general nature relating to the status of this application should be directed to the group receptionist whose telephone number is 571-272-3700. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jean Homere can be reached at 571-272-3780. The Official Fax Number is: (703) 872-9306

Fred Ferris. Patent Examiner
Simulation and Emulation, Art Unit 2128
U.S. Patent and Trademark Office
Randolph Building, Room 5D19
401 Dulany Street
Alexandria, VA 22313
Phone: (571-272-3778)
Fred.Ferris@uspto.gov
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